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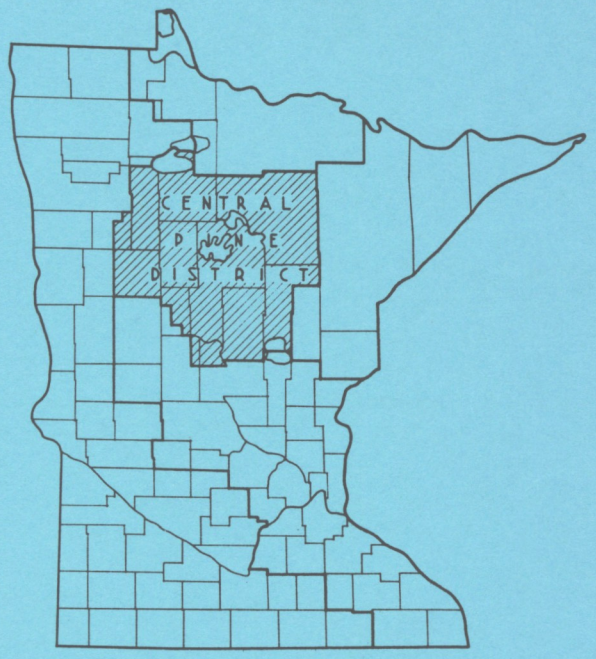
THE FOREST SITUATION IN THE CENTRAL PINE DISTRICT MINNESOTA



PRELIMINARY STATISTICS AND ANALYSIS OF DATA OBTAINED FROM FOREST SURVEYS AND OTHER ECONOMIC STUDIES BY THE

LAKE STATES FOREST EXPERIMENT STATION
UNIVERSITY FARM — ST. PAUL MINNESOTA

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

FOREWORD

Fundamental to sound planning in either public or private forestry are reliable basic data on the local and national timber situation.

From time to time, estimates have been made of the volume of timber left standing in the country, current rate of growth contrasted with the rate of depletion, and forecasts made of future timber needs. At no time, however, until the National Forest Survey was authorized by the McSweeney-McNary Act in 1928 was any systematic effort made to carry on a complete field survey to gather the needed information.

The present Forest Survey, which is now under way in most of the important forest regions of the country, is such a field survey. The five-fold aim of this survey is:

(1) Inventory. To take stock of the supply of timber and other forest products and the areas of land available for growing timber. This information is collected by natural economic units tributary to certain groups of wood-using industries. Ownership and availability of the timber are also considered.

(2) Growth. To ascertain the current rate of growth and the growth prospects under different types of management - mere protection, extensive management, and intensive management.

(3) Drain. To determine the rate of depletion from industrial and local timber use, windfall, fire, insects and disease.

(4) Requirements. To determine the present consumption and the probable future trend in the requirements for timber and other forest products.

(5) Conclusions. To correlate these findings with existing and anticipated economic conditions in order that policies can be formulated for the effective use of land available for forest production. Locally, this will often involve an analysis of the cutting budgets of individual companies and consideration of steps necessary to maintain economic units on a self-sustained basis.

The Forest Survey is an activity of the Division of Research, Forest Service, U. S. Department of Agriculture. The Minnesota Survey is conducted by the Lake States Forest Experiment Station with the co-operation of the Minnesota Department of Conservation.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

St. Paul, Minn.
January 7, 1936.

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Dear Sir:

The Forest Survey of Minnesota, now completed, divides the state into four economic units, (1) the Cloquet-Superior district, (2) the Central Pine district, (3) the Rainey River district, and (4) the woodlot and prairie district.

A description and preliminary analysis of the Cloquet-Superior district was given in our "Economic Note" No. 2 of last July. The enclosed report "Economic Note" No. 3, deals with the forest conditions in the Central Pine district. The other two districts will be discussed later.

The large purchases of land for National Forests and the activities of the CCC camps have given the impression that the forest problem of the State has been pretty well solved.

The facts presented in this report provide a background for appraising what has been done and what still remains to be done.

In spite of the splendid public efforts of the past two years, only one-fifth of the land in the Central Pine district is publicly owned and the bulk of privately owned timberlands including the most accessible and productive areas close to Brainerd, Bemidji and Grand Rapids are not affected by the CCC camps. These lands continue to be poorly protected from fire and are subject to the same old methods of indiscriminate cutting.

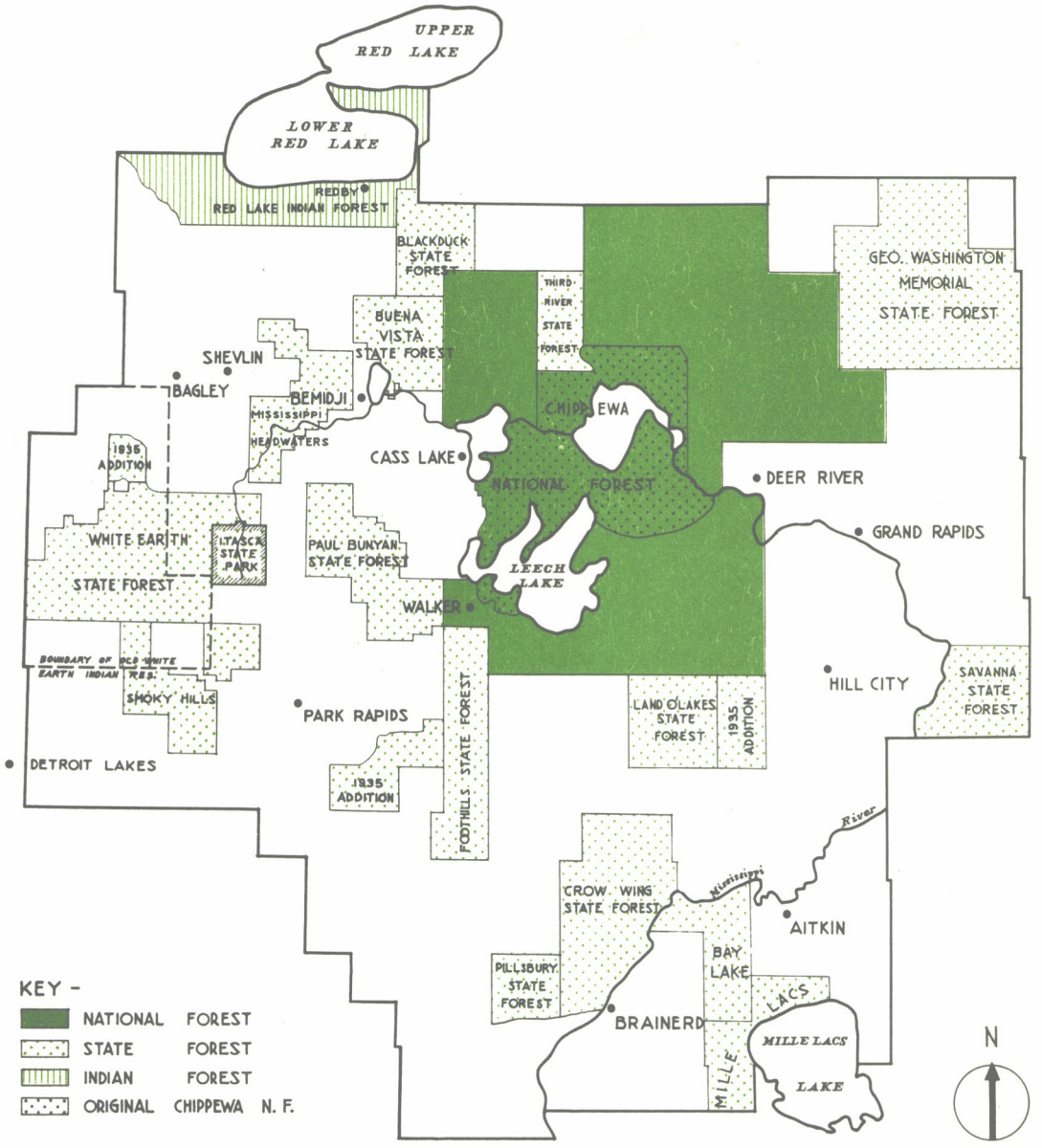
As a matter of fact, the situation is such that many industries now depending upon the district for raw wood supplies are likely to have to go out of business in the relatively near future since the public forests alone cannot support them.

The report outlines a plan of cooperation between private owners and the state and federal government by which the entire district may be made permanently self-sustaining. The plan calls for little new legislation and the cost is small in comparison with the benefits.

The report is submitted for your criticism and suggestions.

Very sincerely yours,

Raphael Zon
Director



OUTLINE MAP OF
CENTRAL PINE AREA
NORTHERN MINN.
1935

SCALE
0 10 20 30 40 MILES

SURVEY FINDINGS IN BRIEF

1. The Central Pine District of Minnesota, embracing the headwaters of the Mississippi River about Brainerd, Bemidji and Grand Rapids, has a gross land area of 7,206,000 acres. Of this, 5,284,900 acres or 73.3 percent are classified as forest land. (Table 4)

2. This is naturally a highly productive forest unit. It has a large local market for wood products and has ready access to markets in the prairie states, in the Twin Cities, St. Louis and Chicago. It has all of the essentials for a permanent and prosperous timber industry - except the wood.

3. After 80 years of lumbering, practically the entire area has been cut over and much of it has suffered and is still suffering from forest fires. One sixth of the forest land is at present deforested. Forty-six percent is occupied merely by aspen and scrub oak. Old growth sawtimber remains on only 1.26 percent of the land. (Table 5)

4. There are approximately 2½ billion board feet of sawtimber standing in the unit - an average of not quite 500 board feet per acre. About 1¾ billion feet are growing in merchantable sawtimber stands, the balance is scattered on the cut-over land. Of this merchantable volume, roughly one billion feet is made up of pine and other softwoods. (Table 10)

5. There are about 4 million cords of pulpwood in small trees and in tops of the sawtimber trees. Only ten percent of this volume is spruce, the most desirable pulpwood species. Nearly 40 percent is aspen, nearly 30 percent jack pine, species little utilized in this district at the present time. (Table 11)

6. Present industries in the district consist of 324 small sawmills, two pulp and paper mills, two cooperage plants, twenty-one shingle mills and twelve lath mills. (Table 1) Local sawmills produce normally about 97 million feet of lumber and ties. (Table 2) Pulp mills in this and adjoining districts consume about 104,000 cords of pulpwood annually. (Table 3)

7. Fires and other damaging agencies take an annual toll of 22 million feet of sawtimber and an enormous volume of smaller material. Average total depletion from cutting, fire, etc., is about 137 million board feet of sawtimber and 152,000 cords of pulpwood. (Table 17)

8. Average growth expected during the next ten years is 126 million board feet plus 334,000 cords of pulpwood. The white and Norway pine types are being cut two and a half times as rapidly as new sawtimber is being grown. Over-cutting is evident also in the balsam and spruce types where pulpwood is being taken out twice as rapidly as new growth is accumulating. There is an excess of growth over depletion in the jack pine and aspen types. (Table 17)

9. Something over a million acres of cut-over land have restocked naturally to pine, tamarack, spruce and balsam fir. A half million acres bear timber which is already of cordwood size. (Table 5) With

proper cutting methods and good protection from fire, this area alone should be able to produce perpetually a volume of softwood sawtimber and pulpwood equivalent to that now being cut in the district. Gradual improvement under good forest management of the deforested areas now covered with inferior types would permit considerable expansion in present industries.

10. The Central Pine district has a number of critical social problems resulting from decline of lumbering, irregularity of employment in mines, and farming on scattered tracts of inferior land. During the past year from 15 to 20 percent of the population of some of the counties has been on relief.

11. Even now, under average conditions, forest industries provide at least part-time work for around 2,000 men in the mills and close to 10,000 in the woods, including the 6,900 farmers who market sawlogs, pulpwood, ties and poles cut from the farms. Under better management, the forests of this district will undoubtedly contribute much more to industrial activity, improve the local employment situation, and make possible a form of farm-forest-resort development in districts which cannot support life on the basis of ordinary farm crops.

12. Unfortunately, the young pine and spruce stands have suffered and still suffer severely from forest fires and improper cutting. As a result, a majority of the stands are understocked and promise to yield only a fraction of the timber which such lands are capable of producing.

13. A continuation of the trends manifested during the past ten years will result not in expanded forest industries but in further curtailment of those operating on white pine and spruce.

14. Specific suggestions for improving the situation are listed on

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ECONOMIC NOTES NO. 3

OCTOBER 1935

LAKE STATES FOREST EXPERIMENT STATION*

Forest Service U. S. Dept. Agr.

THE FOREST SITUATION IN THE CENTRAL PINE DISTRICT OF MINNESOTA

The figures which describe the present condition of the forest lands at the headwaters of the Mississippi River reflect some of the most dramatic episodes in the history of lumbering in the Lake States region. They picture the net result of 80 years of destructive pine lumbering and poor protection, punctuated by sporadic efforts for conservation. They portray with utter frankness the outcome of the struggles over the disposition of Indian timberlands in the '90's. They display the rewards of constructive efforts to save strategic areas for public use, including the creation of the Chippewa National Forest and Itasca State Park. They show the results of the battles between foresters and agricultural enthusiasts and the ups and downs of colonization and industrial development. Finally, they set forth in fairly concrete terms the facts which must be faced and the adjustments which must be made if the aims of the forest projects already initiated are to be realized and if the forest lands are to play their rightful part in the development of northern Minnesota.

EARLY DEVELOPMENT

Except for a small area of natural prairie in Hubbard, Becker and Wadena Counties, the entire Central Pine District was originally forested. In a completely glaciated region, the forest soils consisted of characteristic peat bogs, moraines and sand plains interspersed with lakes.**

When first explored in the early nineteenth century, black spruce and tamarack forests covered most of the peat lands and occupied possibly fifteen percent of the area. The gravelly moraines and till plains which spread over much of the southern and central part of the district supported stands of white and Norway pine. Jack pine was the principal species on the coarse glacial outwash along the Mississippi and Crow Wing Rivers. Balsam fir and white spruce were found on the heavier upland soils to the north; maple, basswood and oak farther south.

The original forest contained many splendid stands of pine timber, some of which ran from 25 to 30 thousand board feet per acre. On the other hand, there were large

* Maintained by the U. S. Department of Agriculture in cooperation with the University of Minnesota, University Farm, St. Paul, Minnesota. This report contains preliminary figures subject to revision.

** Leverett, Frank and Purssell, U. G., *Surface Formations and Agricultural Conditions of Northwestern Minnesota.* Minnesota Geological Survey, Bulletin Number 12, Minneapolis, Minnesota, 1915.

areas averaging less than three thousand feet to the acre. There were large swamps and sand plains of naturally low productivity. Likewise, fires and wind storms had taken a serious toll of the border forests.

Early Lumbering

The forest history of the Central Pine Region is intimately bound up with the story of Indian treaties and with the disposition of Indian lands.

White explorers touched the southern end of the district in 1679-80. Fur trading posts were established in the 18th century but it was not until the middle of the 19th century that settlement and lumbering gained any headway in the district.

In 1855 the Chippewa Indians ceded a large part of their territory containing valuable pine timber to the United States.* They kept for themselves reservations at Cass Lake, Leech Lake, Lake Winnibigoshish and several other localities in the district. Lumbering, which was already exhausting the resources of Rum River and the lower Mississippi, moved gradually above Mille Lacs and up the Crow Wing into this virgin territory. The construction of the railroad to Brainerd in 1870 and the gradual extension of other lines to Grand Rapids, Detroit Lakes, Deer River and Bemidji opened the way for multiplication of sawmills and lumber camps during the latter part of the century.

Pressure soon became great for more Indian stumpage. In 1889 the Chippewa ceded the remaining tribal lands and timber to the United States, retaining individual allotments of not more than 160 acres each. Under the terms of the cession, the pine was to be sold to the highest bidder at public auction and the money received was to be held in trust for the Indians for 50 years.

In the sales which were made, the estimates were notoriously low and the Indians received very low prices for their lands. Indian lands suffered also from trespass in connection with sales of dead and down timber under the Act of 1897. Millions of feet of thrifty living trees were cut along with the dead material.

The Fight For Conservation

In 1898 General C. C. Andrews, Chief Fire Warden for Minnesota, began advocating the creation of a national park to include the wonderful white and Norway pine stands surrounding Leech Lake and Cass Lake. The movement was supported by the Federation of Women's Clubs and in 1899 the Minnesota National Park and Forestry Association was organized for the specific purpose of promoting the reservation of the area for recreational purposes. The movement was strong enough to temporarily block the sale of pine on the adjacent Indian reservations.

Under the Morris Law of June 27, 1902, sale of timber from Indian lands was put on a different basis. Sales were made by sealed bids and paid for on log scale which gave the Indians three or four times as much revenue as the previous open sales on estimate.

On the Cass Lake and Leech Lake area cutting was more carefully done under the supervision of foresters and slashings were piled and burned. On 200,000 acres, five (later ten) percent of the mature timber was reserved for seed trees. Some 10,600 acres of virgin timber were reserved outright. The 200,000 acre tract, as cut over, was placed under the direction of the newly-created Bureau of Forestry in the

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* Folwell, William Watts, *A History of Minnesota*. Volume IV. Minnesota Historical Society, 1930.

U. S. Department of Agriculture. It was for a time the only forest property under the jurisdiction of this Bureau. In 1908, two townships were eliminated from the reserve but the remainder, 190,944 acres, including the virgin timber on the Ten Sections, Star Island and Pine Point, were formally designated the Minnesota National Forest (later Chippewa National Forest). This was the first national forest east of the Mississippi River.*

Developments on the White Earth Indian Reservation to the west were less gratifying. When this reservation was originally established in 1867 it was the intention to maintain it as a permanent home for the Chippewa and if possible transfer to it all Minnesota Chippewa except the Red Lake bands. The plan was to provide individual homes of 80 acres on the prairie which occupied the western half, and to maintain the eastern half as an Indian Forest - a hunting ground as well as source of firewood, logs and lumber. The forest likewise was to provide a basis for part-time employment in community mills.

Allotments were actually made on this basis. Several model communities were established, and a number of sawmills were built by the federal government. The outlook seemed most promising. About the beginning of the twentieth century however, pressure was put upon Congress to open up the agricultural lands for settlement and the timberlands for logging. The reservation was opened in 1906.

The reservation timber in the Ottertail River drainage was driven out by water to Frazee, where it was milled. A mill at Ada received the logs from the Wild Rice River. A Park Rapids company logged in the southeastern corner. The mill at Akeley took the timber from the northeast corner. Between 1906 and 1915 the White Earth reservation was practically stripped of pine timber.

Conservation efforts on the Red Lake Indian Reservation began too late to save much of the original timber. In 1889 four fifths of the original reservation was opened up for exploitation, the timber being sold at public auction. An additional area was relinquished in 1904. The tribe was left in possession of about 400,000 acres, about half timber and half marsh. The timber land contained some exceptionally fine stands of pine aggregating 165 million board feet in volume. In 1916 this remaining timber was designated the Red Lake Indian Forest. During the summer of 1917, almost the entire area in the Reservation south of the lake was burned over by forest fires. This necessitated sale of the timber. The area was carefully logged, brush being burned as logging proceeded and seed trees were left wherever possible. These trees did an excellent job of seeding until they were blown down by a cyclone in the autumn of 1930. Today, while there are only about 10,000 acres of virgin timber left on the Reservation, there are large tracts of promising reproduction which under the kind of protection and management now being given by the Indian Forest Service will in time produce valuable stands of timber.

Two further developments in early public forestry deserve comment. Late in the nineteenth century the State of Minnesota decided to build up a State park about Lake Itasca at the extreme head of the Mississippi River. Arrangements were made with the principal lumber company to reserve timber along trails and lake shores and the stumpage was paid for by the State. The company also donated large tracts of cut-over land while other desirable areas were purchased by the State or donated by the federal government.

Altogether, over $300,000 were invested in blocking up an area seven miles square. The tract, known as Itasca State Park, now contains 32,000 acres and includes about 125 million feet of virgin pine timber.

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* Chapman, H. H., *The Chippewa National Forest*, American Forests, September, 1929.

The donation of a few hundred acres of cut-over land on the west side of Gull Lake led in 1897 to the creation of another small State forest, the nucleus of the present Pillsbury State Forest.

PRESENT CONDITIONS IN THE DISTRICT

The principal cities and villages in the Central Pine District are:

	Population 1930
Brainerd	10,221
Bemidji	7,202
Crosby	3,451
Grand Rapids	3,206
Nashwauk	2,555
Kewatin	2,134
Park Rapids	2,081
Aitkin	1,545
Cass Lake	1,409
Bovey	1,248
Coleraine	1,243
Ironton	1,033
Bagley	885
Deer River	832

Greatest development in agriculture has taken place in the southern part of the district in the vicinity of Brainerd. Warmer climate, better transportation facilities, easier access to markets and comparatively easy land clearing have favored this area rather than the northern part of the district.

Roughly, 38 percent of the southern five counties is in farms with 15 percent of the gross area in cultivation. Agriculture has not been entirely successful on the sandy lands, however, and expansion is not rapid at the present time.

In the Northwest, about 22 percent of the gross area is in farms with 6½ percent cultivated. This section is comparatively young in agricultural development and some settlement is still in progress. The area contains some first class agricultural soils but due to relatively unfavorable climate and market conditions, it will doubtless be many years before any large percentage of the land is claimed for agricultural crops. At present many farmers depend upon woods work and tourist trade rather than farm crops for cash income.

In Itasca County about Grand Rapids, only 12½ percent of the land is in farms and less than 3 percent under cultivation. Farms are small and scattered. Farmers depend to a very great extent upon tourist business and woods work to supplement income from dairy and field crops.

Although agriculture will doubtless increase gradually in the Central Pine District it seems unlikely that more than 30 percent of the total area will be included in farms or cities or that over 10 percent will be cleared and put into crops in the very near future. Tentative zoning plans for the counties included in the district suggest that about 57 percent of the entire area, or roughly 4,100,000 acres, should be closed more or less permanently to agricultural development and devoted to forestry and other similar uses.* These forest areas will of course

* Jesness, Oscar B. and Reynolds I. Nowell, *Land Use in Northern Minnesota*, University of Minnesota, 1935.

support a certain number of part-time farmers who will participate in forest development, logging and fire protection.

A large and expanding tourist business has grown up around Brainerd, Grand Rapids, Park Rapids and Bemidji as a result of the numerous lakes with wooded shores and sandy beaches. Hunting and fishing in the surrounding forest and marsh land have added to the other recreational attractions. While development is most marked in these principal lake regions special attractions such as virgin pine forests at Cass Lake, Itasca Park and the groups of lakes adjacent to the prairies in the western part of the district draw an increasing number of vacationists.

Principal industrial development centers at Grand Rapids and the Mesabi Iron Range communities to the east and at Brainerd and the Cuyuna Iron Range towns in Crow Wing county. Until 1930 the iron mines proved a dependable source of employment and tax revenue in the two counties concerned. Since 1930 there have been serious unemployment and distress in these communities, relieved in part by Emergency Conservation Work in the surrounding forests.

Forest Industries

In 1933 there were 361 primary wood-using plants in the Central Pine District including 324 small sawmills, two pulp mills, two cooperage plants, 21 shingle mills and 12 lath mills.

These remaining forest industries fall into three territorial groups - those centering around Brainerd in the southern part of the district, those around Bemidji in the northwest and those around Grand Rapids in the northeast.

Brainerd District

The southern half of the unit, including part or all of Becker, Hubbard, Wadena, Crow Wing and Aitkin counties was opened up earlier than the northern district, and is farther along in the cycle of timber exploitation. All of the larger sawmills and many of the subsidiary wood-using plants have disappeared.

There is a pulp and paper mill at Brainerd. Aitkin, Pine River, Backus, Ponsford, Emily, Brainerd, Deerwood and Rossberg claim one or more small sawmills each. There are small portable outfits scattered throughout the district.

At Aitkin there is a cooperage mill specializing in barrel heads cut from basswood and another cutting slack staves, hoops and liners from elm.

There is a large tie and pole treating plant at Brainerd.

At Little Falls and Sartell just south of the district boundary, there are two other pulp and paper mills which draw upon the Central Pine District for wood. In the prairie region to the west there are several small sawmills also maintained by wood from this area.

In 1929 over 3,000 farms in these southern counties reported sale of forest products to industries. The principal items were 13 million feet of sawlogs, 10,000 cords of pulpwood, 27,000 ties and 6,750 poles. Sale of 535 gallons of maple syrup and 108 pounds of maple sugar was also reported in Aitkin county. The value of forest products sold was estimated to be $330,000.*

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* Fifteenth Census of the United States, 1930, Minnesota, *Farms, Acreage, Values, and Selected Livestock and Crops.*

Bemidj District

Fair-sized sawmills are located at Bemidji, Cass Lake and Redby. Smaller mills or groups of mills are located at Bagley, Shevlin, Wilton, Pinewood, Nebish, Tenstrike, Hines, Northome, Bena, Round Lake and at various points in the country.

The largest mill at Bemidji employs about 27 men in the sawmills and 100 in the adjoining box factory. In 1933 some 4,760 M board feet of logs were purchased from within a 30 mile radius. These consisted of 2,380 M board feet of aspen, 2,080 M board feet of jack pine and 300 M board feet of miscellaneous hardwoods. Production in 1933 was about half of normal.

A tie mill at Bemidji produced 48,000 ties in 1933. It also manufactured railroad shims using about 215 M board feet of ash, elm and birch. One large portable mill near town cut over 1,000 M board feet of lumber in 1933 from jack pine, aspen and spruce. Nine other portables close to town cut altogether about 3,000 M feet of box lumber and ties.

At Redby, the Office of Indian Affairs maintains an up-to-date sawmill of 40 thousand feet daily capacity (about 6 million feet annual capacity). It employs about 60 men. In 1934 only 880 M feet of lumber were cut for fish boxes and rough boards.

Near Bagley and Shevlin a group of a dozen small sawmills cut altogether around 2,000 M feet of lumber annually.

At Cass Lake a box-board mill cut 3,400 M board feet of aspen lumber in 1933. This was about half of normal production. Forty-five men were employed in the mill.

There are usually several large pulpwood operations in the vicinity of Bemidji, the wood going principally to International Falls, Little Falls, and Sartell. Cedar operations - posts and poles - are also of some importance in this district.

Farmers in Clearwater, Beltrami and Cass counties used or marketed 12.3 million feet of sawlogs, 14,300 cords of pulpwood, 36,200 ties and 13,700 poles in 1929. At least 2,660 farmers were engaged part-time in handling these forest products, which added $350,000 to the farm income of the district. Farm production of maple syrup amounted to 350 gallons, and of maple sugar, 2,524 pounds.

Grand Rapids District

A large modern pulp and paper mill and also several small sawmills are located at Grand Rapids. The pulp mill, using a combination groundwood and chemical process, required about 26,000 cords of spruce and 2,500 cords of balsam fir pulpwood annually. It employs 40 to 50 men.

Eight small sawmills and a lath mill in or close to Grand Rapids use about 500 M board feet of sawlogs annually.

At Deer River, 20 miles to the west, there are two box mills. The larger mill employs 45 men and cuts from 2,500 to 8,000 M board feet of box boards for box factories located at Cloquet, Minnesota, and Chicago, Illinois. About half the volume cut is aspen, the other half pine, balsam fir and basswood. The second mill employs 15 men and manufactures cheese-box lumber from aspen and basswood. Normal output is about 500 M board feet. Within a few miles of Deer River are five other small portable sawmills and shingle mills cutting, all told, about 125 M board feet of lumber.

The large woodenware plant at Hill City has now closed down. All that remains are two portable mills cutting lumber, ties, lath and berry pickets. A small mill is located at Remer, a larger mill at Federal Dam on Leech Lake and a number of small portables scattered over the district.

The district about Grand Rapids is invaded by outside pulp mills and is the source of much of the best aspen match stock used by the match and clothespin factory at Cloquet, Minnesota.

Farmers in Itasca county cut 4.4 million feet of sawlogs, 88,300 cords of pulpwood, 67,600 ties and 10,500 poles in 1929. Twelve hundred farmers reported sales aggregating $225,000.

Present Public Forests

To bring the public forest picture up to date it is necessary to review briefly the extensions made in both federal and state forests since 1933.

National Forests

The Chippewa National Forest in 1932 contained a gross area of 312,659 acres of which 193,604 acres were owned by the federal government, 80,629 by the State of Minnesota and 38,426 by Indians and other individual private owners. The government's two thirds was primarily pine land and carried a total stand of 244 million board feet, including 71 million feet of Norway pine and 22 million feet of white pine sawtimber. This is unquestionably one of the most productive and best situated forest areas in Minnesota.

The state land lying principally south of Lake Winnibigoshish was a residue of the Swamp Land Grant of 1860. One fifth of the state land was open muskeg, one fifth devastated pine land and three fifths swamp forest of low productivity. The total merchantable volume on state land was only about 7½ million board feet of sawtimber and 11,500 cords of pulpwood.

In 1934-35 three large additions to the Chippewa National Forest were approved by the National Forest Reservation Commission. One extension was north and east to include 24 townships of land tributary to Grand Rapids. Another extension included 8 townships northwest in the vicinity of Bemidji and the third included 17 townships south and east of Leech Lake. The gross area involved was approximately 1,000,000 acres of which 360,000 acres had been acquired or optioned by the federal government up to October 15, 1935.

The northeastern extension contains large areas of promising pulpwood land which will be a valuable accession to public forests. It contains some fairly large tracts of over-mature virgin timber. On the other hand, it contains some extensive areas of non-productive swamp and devastated upland. It includes a large number of scenic lakes which already support considerable resort development. This part of the forest embraces a fairly large acreage of state-owned forest land, the best of which lies in a block of four townships in the northeast corner of Itasca county. This block has 30,742 acres of State timber land bearing 12½ million feet of sawtimber and 35,000 cords of pulpwood.*

The northwestern extension likewise embraces some very promising pulpwood

* Conzet, G. M., *STATE LANDS: Their Agricultural and Forest Possibilities*, Minnesota Department of Conservation, 1928.

lands, including over 17,000 acres owned by the State of Minnesota.

The southern extension once supported good stands of white pine but at present is dominated by inferior hardwoods, aspen and stagnated spruce.

On the whole, the two northern extensions, plus the northern half of the original forest, promise to have the greater bearing upon the industrial and recreational development of the district.

Indian Forests

The Red Lake Indian Forest, established in 1916, contains about 110,000 acres of forest land. This includes 10 sections of residual virgin pine with an estimated volume of 60 million board feet. It has a large area of promising reproduction and aspen second growth on the cut-over portions. This forest's greatest value is in offering productive employment to the Red Lake Indians who not only manage the forest but now do all of the logging and milling.

During the past year the Indian Service has been buying up forest lands in two townships along the eastern margin of the old White Earth Reservation. The aim is to develop here another small forest in which management and utilization will be handled entirely by the Indians.

State Forests

State Forests now embrace a gross area of about two million acres of which 14 percent is state-owned land.

The George Washington State Forest, established in 1933, has a gross area of 341,440 acres of which 76,642 acres are state land. About 92 percent of the forest lies in the Central Pine District. Type proportions run:

Aspen and paper birch	37½%
Coniferous swamps	25 %
Pine	12½%
Non-productive	12½%
Spruce-balsam	7½%
Hardwoods	4 %
Improved farm	1 %
	100.0%

There are about 7,000 acres of pine sawtimber and nearly 25,000 acres of pine cordwood. Included in the 85,000 acres of coniferous swamp are 50,000 acres of spruce and balsam of merchantable size. Some of the aspen is of excellent quality and many stands have an understory of balsam fir. Altogether this is a very promising unit for concentrated development. Present state land is largely swamp.

The Third River State Forest, consisting of two townships containing 17,279 acres of state land, was established in 1933 but has now been included within the boundaries of the extended Chippewa National Forest. It is a very promising pulpwood unit.

The White Earth State Forest was established in 1933 with a gross area of 229,560 acres. The area is principally cut-over pine land with some fair hardwoods along the western border.

Present type proportions are approximately:

Aspen and paper birch	36 %
Hardwoods	23 %
Non-productive	14 %
Pine	7 %
Coniferous Swamps	7 %
Improved Farm	3 %

There is very little mature pine left but around 20,000 acres of jack pine have reached cordwood size. Around 15,000 acres containing pulpwood stands of spruce and balsam fir are to be found on the unit. There are about 10,000 acres of merchantable sized hardwoods. The unit contains a number of lakes with good recreational possibilities. Considering the fair quality of the growing stock and the proximity of the area to the prairie, it must be rated as among the more promising of the state units. At present there are only 7,476 acres of State-owned land but 134,000 acres of private land are tax-delinquent and likely to revert to State ownership.

The original Foothills State Forest as laid out in 1933 consisted almost entirely of devastated white and Norway pine lands covered with young aspen. The land while naturally productive is in bad shape and will require many years to recuperate. The area added to the west in 1935 contains a fair amount of young jack pine and should recover more rapidly. It likewise is more accessible and can be more easily logged. Present state ownership is small but tax delinquency is very heavy.

The Land O'Lakes State Forest is similar to the southern addition to the Chippewa National Forest. It contains a limited amount of good jack pine and some productive swamp but is made up primarily of devastated pine lands covered with aspen and brush.

The Pillsbury Forest, while at present covered principally with aspen, is valuable as a game refuge and as a background for resort development near Brainerd. It is accessible to established industries and can ultimately be developed into a very productive timber producing unit.

In 1935 the State Legislature, in addition to making extensions to the White Earth, Pillsbury, Foothills and Land O'Lakes Forests, created eight new state forest units.

The Crow Wing State Forest close to Brainerd was established in a territory which was already fairly well settled and which had quite intensive resort and summer home development about the numerous lakes. Tax delinquency while very small on the lake shore properties, farm land, and even the better forest areas, is a serious problem inasmuch as the non-paying undeveloped land throws an extra burden upon the productive properties. The State Forest was set up, not to exclude or compete with agriculture and recreation, but to facilitate private ownership and management by providing better fire protection and putting some of the unused land to work. It is not expected that the State will even attempt to acquire anything approaching full ownership in this unit.

The Bay Lake State Forest is in poorer condition than the Crow Wing. Forestry, agriculture, recreation and mining, however, all have a place in the development of this area. A practical forest management program should add to the income of farmers and resort keepers and should provide a means of equalizing industrial employment in the mining district. That is, forest development work can be planned for periods of slack mining activity. Only partial State ownership is contemplated.

The Mille Lacs Unit surrounds Lake Mille Lacs on the north and west. It contains large areas of culled over hardwood, some valuable second growth maple, elm, oak and pine and a few spruce swamps. At present there is practically no publicly-owned land on the shores or within easy reach of this popular resort lake.

The Smoky Hills Unit surrounding Ponsford contains some promising jack pine reproduction and with little effort can be developed into a valuable pine forest. It is readily accessible to Park Rapids, Detroit Lakes and other points on the railroad.

The Paul Bunyan State Forest in Hubbard County is made up principally of devastated pine lands covered now with young aspen. In the northwest corner there are several thousand acres of good jack pine approaching merchantable size. This part of the forest is very accessible to established industries and can be easily logged. The State has recently acquired some 32,000 acres of aspen in a tax settlement with land owners. Other large blocks may be expected to revert if present tax delinquency laws are left as they are. Except for the areas now supporting pine, this land will have to be protected many years before it can produce any valuable timber. There is little opportunity for intensive recreational development but the unit has possibilities as a game refuge and as such will enhance the recreational values of resort development around Park Rapids, Walker and Cass Lake.

The Blackduck State Forest has been established in an area which is considered suitable for agricultural development. Throughout the farming district, however, there are extensive areas of peat swamp and sterile upland which can better be handled as forest. Farmers in this region require supplemental income from woods work and it is believed the existance of a well managed state forest will add to the chances of agricultural success. Rapid acquisition of land for forestry is not contemplated.

The Buena Vista is a unit with good possibilities for both recreation and forestry. The state already owns some valuable pine land on Lake Bemidji.

The Mississippi Headwaters Forest, while well situated for ultimate development, is at present badly run-down. It includes relatively little state land but encloses large tracts of tax delinquent land.

Of the 15 State Forests established on the district to date, the George Washington in the northeast, the Buena Vista, White Earth and Smoky Hills in the west, and the Crow Wing and Bay Lake in the south seem to fit most significantly into the industrial pattern of the district.

PRESENT FOREST LAND OWNERSHIP

Actual public ownership is much smaller than is suggested by the extent of public forests. At the time this survey was made in 1934, public agencies controlled only 1,136,029 acres or 21.5 percent of the forest land. Slightly more than half of this was state land, the balance Indian or National Forest.

Public ownership assumes most significance in the case of old growth pine and hardwood sawtimber. Over 75 percent of the old growth hardwoods and nearly half of the old growth pine is now in public ownership.

Public control of pine cordwood and restocking areas is less firmly fixed. Only 10 to 15 percent is now in state or federal ownership.

In coniferous swamps, public agencies have a large interest. The federal government controls 11 percent of the cordwood area, while 35 percent is in state ownership. The state itself owns practically 40 percent of the restocking swamp land.

Public agencies own close to one third of the standing white and Norway pine sawtimber volume. The public share of sawtimber volume of all species is slightly less than one fourth.

In pulpwood, about one third of the spruce, one fourth of the balsam fir, one fifth of the aspen and one seventh of the pine is found on state or federal lands. (See Table 12)

A little less than one third of the timber land in private ownership is controlled by lumber companies or other large land owners - the other two thirds by owners of less than 1,800 acres each. Large owners control 37.6 percent of all the old growth pine sawtimber area, 41.7 percent of the spruce-balsam sawtimber area and 26 percent of the pine second growth. Small private owners have their largest interest in the upland hardwoods, pine cordwood and reproduction, aspen, scrub oak and deforested land. (Table 6)

Condition of Forest Lands

From the standpoint of future forest productivity, the points in the present situation which give particular concern are first, the comparatively small acreage of desirable types, and second, the poor density and poor distribution of size classes in the remaining pine and spruce forests.

The original forests of about seven million acres have been reduced to 5,284,900 acres. Pine now occupies only 12 percent of this area. The white and Norway pine types, which were the support of the thriving lumber industry at the beginning of the century, are reduced to 152,200 acres or 3 percent of the total forest land.

The spruce and spruce-balsam types, which are second in commercial importance to the pine, cover 465,400 acres or 9 percent of the forest area.

At the expense of these better types, aspen, scrub spruce, scrub oak, grass and brush have spread to a total area of 3,405,100 acres or 64 percent of the total. Upland hardwoods constitute 6 percent and miscellaneous swamp types other than black spruce, 8 percent of the present forest.

The white pine type shows a comparatively large acreage of mature and overmature sawtimber, a lesser amount of growing cordwood, and a totally inadequate amount of restocking land. (Table 5) About half of the sawtimber stands are well stocked but only a little over one quarter of the cordwood and restocking areas are of good density.

The Norway pine type has a somewhat better distribution of size classes but also shows an inadequate area of restocking land. Only 44 percent of the stands are well stocked.

The jack pine type contains a relatively small area of timber large enough for sawlogs but contains large areas progressing toward merchantable size. Unfortunately, only 34 percent of the cordwood and only 19 percent of the restocking land is well stocked. Over 50 percent of the young growth is of definitely poor density. Nearly 300,000 acres of pine land are temporarily deforested.

The pine types as a group have suffered severely from over-cutting, slash fires following logging, premature logging for lath, box lumber, etc., and destructive forest fires.

The spruce-balsam type has a fairly good distribution of size classes including over 50,000 acres of sawtimber and over 100,000 acres of cordwood. However, only about 30 percent of the stands are well stocked. In the sawtimber stands there is a large volume of overmature balsam fir and aspen ripe to be cut.

There are 56,800 acres of deforested spruce - balsam land.

Seventy percent of the productive spruce swamps are below merchantable cordwood size or have been cut over so recently that they contain less than three cords of wood per acre. Less than one third of the spruce stands are well stocked. These swamp forests give definite evidence of over-cutting and cutting to too small a diameter limit.

There are some fairly large areas of stagnant swamp and also areas of open muskeg within the district which are of little value from a forestry standpoint.

The forests in the different parts of the district vary considerably in natural type and in present condition. The Brainerd division, composing the southern part of the district, is primarily a sandy, pine country. It has been almost entirely cut over and is now occupied by aspen, jack pine and scrub oak. To the east near Aitkin it contains some mature hardwoods of both the upland and bottomland types. There are a few scattered spruce swamps. The Bemidji division is of mixed character. It is primarily pine land and at Red Lake, Cass Lake and Itasca Park it contains the best of what is left of the virgin pine forests. On the heavier soils and often mixed with the pine is a heavy growth of balsam fir and aspen. To the west there are stands of better hardwoods. Spruce and cedar swamps are common throughout the district. The Grand Rapids division is essentially a spruce-fir region. Aspen and balsam fir are the most common trees in the present stands. There are a few stands of mature virgin white pine, and a few tracts of excellent white spruce.

Present Timber Volume

There are 2,480,240,000 board feet of sawtimber standing in the district - an average of 469 board feet per acre. Of this total 1,773,970,000 board feet are growing in so-called sawtimber stands, or areas bearing at least two thousand board feet per acre. The balance is thinly scattered over logged and burned areas. The total stand of pine and other softwoods in sawtimber stands is only 1,084,580,000 board feet. Roughly one fourth of this softwood volume is included in parks, resorts and other reservations, and therefore is unavailable for commercial utilization.

There are 3,965,000 cords of pulpwood - about 26 times the present rate of depletion in the district. Nearly 40 percent of this volume is aspen and nearly 30 percent jack pine, species which are little utilized at the present time. The 398,000 cords of spruce pulpwood is only ten times the present average cut of this species in the district. This does not mean that the supply of spruce will be totally exhausted in ten years. The supply is being increased each year by growth. Also, the cutting of pulpwood from trees less than six inches in diameter or cutting to a smaller top than four inches will have the effect of increasing the available volume. The figures, however, do indicate a serious situation in the spruce types.

Public agencies own close to one third of the standing white and Norway pine sawtimber volume. The public share of sawtimber volume of all species is slightly less than one fourth.

In pulpwood, about one third of the spruce, one fourth of the balsam fir, one fifth of the aspen and one seventh of the pine is found on State or federal lands. (See Table 12)

Growth and Depletion

Including all types, all species and all kinds of material, current growth exceeds current drain in the forests of the Central Pine District. In sawtimber and higher grades of pulpwood, however, there is an unfavorable balance.

Total growth of all kinds amounts to 110,680,000 cubic feet, annual depletion 72,070,000 cubic feet.

Sawtimber growth amounts to about 126,250,000 board feet annually - an average of 24 board feet per acre per year. Sawtimber depletion averages 137,698,000 board feet annually or 26 board feet per acre per year.*

Disparity between growth and depletion is most serious in the white and Norway pine types:

UNFAVORABLE COMPARISONS

	Growth Board Feet	Depletion Board Feet
Norway Pine Type	7,130,000	10,982,000
White Pine Type	2,280,000	14,310,000
Spruce - Balsam	12,250,000	20,163,000
Coniferous Swamps	2,730,000	5,202,000

FAVORABLE COMPARISONS

Jack Pine Type	28,040,000	22,944,000
Aspen Type	53,960,000	41,859,000

In pulpwood, total growth amounts to about 334,000 cords annually or about .06 cords per acre for all types and conditions. Total drain is approximately 152,000 cords, including the average amount wasted by fire and other damaging agencies. (Table 17)

The growth of pulpwood in the aspen type - 175,000 cords - exceeds the annual drain by more than four to one. Similarly the 100,000 cord growth in the pine types completely overshadows the present drain of 27,000 cords.

In the spruce - balsam type the 19,000 cords of pulpwood growth fails to cover the average balsam pulpwood cut of 21,870 cords and falls far short of the total

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* Questions naturally arise as to the adequacy of current growth figures as a basis of comparison with rate of depletion. Calculations of timber yields have been made on two other bases: first, the mean annual growth for the entire life of the stand to time of maturity and second, the possible cut by an area allotment plan designed to even up the size classes in the growing stock. The mean annual growth figure exceeds current growth by over 50 percent, indicating that in the long run growth should be greater than at present. The area allotment plan indicates that only about 100,000,000 feet of commercial timber will be available for cutting annually during the next 40 years without invading the stands which should be reserved for growing stock. For present purposes, it is believed that current growth is a practical measure of the carrying capacity of the forest. Growth on reserved virgin timber has been included, because all over-mature and damaged trees can usually be removed from these stands.

28,000 cord annual depletion in this type.

The pulpwood growth in coniferous swamps, 28,000 cords, also falls far short of the average 49,000 cord depletion. Thus the crux of the pulpwood situation is the shortage of growth in the types most heavily cut.

Social and Economic Conditions

It is possible to comment only briefly here on the conditions which have been partly caused by past lumbering activities and which may be partly connected by future forest development.

Due to the difficulties of farming on the sandy pine lands in the Brainerd district and to the slump in mining during the depression, unemployment and rural relief have been serious problems in this southern division. In June 1934, there were 4,900 persons or 19.1 percent of the population of Crow Wing county receiving relief.* In Aitkin county 2,369 persons or 15.8 percent of the population were on relief. There has been such a small area of public forest in this division that extensive employment in CCC camps has not been feasible.

In the Bemidji district the relief situation is similar. Beltrami County had 3,573 persons or 17.3 percent of the population on relief in June 1934. To quote from the Problem Area report of the F.E.R.A. Research Section, "The original large scale lumbering enterprise (at Bemidji) was the Crookston Lumber Company which continued operations until 1925, when it moved to Blind River, Ontario, taking upwards of 400 mill hands and woodsmen who were employed by it. However, it left behind all the disabled and inefficient workers and this was a permanent contribution to the unemployment problem of the region."

The depressed conditions in the steel industry have been reflected in unemployment and social distress in Grand Rapids and nearby range towns. Forest industries, on the whole, have held up during the depression and have not only given steady work to mill hands but have contributed to the local farm income.

Throughout the northern part of the district, CCC camps and other emergency projects have absorbed a large share of local unemployment and have provided jobs for boys from southern Minnesota and neighboring states as well.

On a normal basis, forest industries should provide at least part time work for around 2,000 men in the mills and close to 10,000 in the woods including the 6,900 farmers who market sawlogs, pulpwood, ties and poles cut from farms. Improvement in productivity of the forests will encourage new industries and bring about corresponding increases on employment.

Adequate fire protection combined with very economical forest management on the public forests will require the services of at least one man to every 10,000 acres. With upwards of 3,000,000 acres in public projects, steady seasonal work for at least 300 men is in prospect. For intensive management under a program corresponding to the present ECW project, this number could be increased tenfold.

OUTLOOK FOR THE FUTURE

The day of the huge pine mills has definitely passed in northern Minnesota. The sawmills of the near future are likely to be either of the small portable type

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* F.E.R.A. Rural Problem Areas, Survey Reports, Numbers 36, 37 and 38, Mimeo. 1934.

operating on farm woodlots or small tracts of second growth timber or of the small permanent type, cutting boxboards and rough lumber from woods within a 30 to 40 mile radius.

There are several natural pulpwood centers favored by adequate wood supplies and ready access to markets which may be maintained on a fairly permanent basis.

There is a local market for mine timbers, poles, posts and other cedar products as well as for fuelwood. In the long run there are opportunities for developing new industries founded on second growth pine, spruce, balsam fir, aspen and other hardwoods, which under improved management can be produced in much greater quantities than at present.

Although future industries will inevitably be widely diffused over the district, the most promising possibilities seem to lie in the vicinity of Brainerd, Bemidji and Grand Rapids.

Brainerd has a number of distinct advantages as a center of forest activity. On the main line of a transcontinental railroad, it has direct connections with the Twin Cities and Chicago to the south, Duluth to the east, Fargo and other Dakota towns to the west. Excellent paved highways radiate in four directions and the surrounding country is accessible by numerous local roads. It is well equipped to concentrate and market forest products.

The Mississippi River furnishes power and water necessary for pulp and paper manufacture. Convenient location and the presence of numerous lakes with wooded shores favor the development of a large tourist trade.

Bemidji, a famous lumberjack headquarters a quarter century ago, now depends more upon agriculture and the tourist trade for support than upon forest industries. Nevertheless, the box mill, saw and tie mills within and near the town are still important elements in the industrial life of the community.

Bemidji has natural advantages which suggest further development along forestry lines. It is on the main line of the Great Northern Railway between Duluth, Minnesota, and Grand Forks, North Dakota, and thus has market outlets east and west. It is surrounded by naturally productive forest lands. A cool summer climate, a group of scenic lakes and a number of groves of virgin pine timber in the vicinity are the groundwork for a growing tourist trade.

Grand Rapids also has natural advantages as a permanent center of wood using industries. It is situated on the Mississippi River in the heart of a natural spruce and balsam fir territory. It is on a branch of the Great Northern leading to Duluth and the Twin Cities. Its local forest roads are inferior to those of the Brainerd territory but it has a larger and more dependable supply of spruce and balsam fir pulpwood for its pulp mill.

In addition to these three centers, a number of other towns have promising possibilities. Sartell, a pulp mill town, although lying outside of the district, should be mentioned because it draws raw materials from the area. Cass Lake and Deer River, with access to National Forest timber, have already stable forest industries of great importance to the communities. Aitkin, with established small sawmills and cooperage plants, has possibilities of permanent hardwood industries. Waubun, Detroit Lakes, Ponsford and Park Rapids are favorably located for utilization of box bolts and similar material from the forests in the western part of the district. Bagley, Shevlin, Redby, Nebish, Wilton and Pinewood will benefit from the continued operation of their small mills. Northome, Blackduck, Tenstrike and Hines are favorably located for utilization of cedar posts and for the sale of other swamp products.

Needed Adjustments in Utilization

It has been pointed out that depletion of white and Norway pine sawtimber and spruce pulpwood greatly exceeds current growth while there is an indicated excess of aspen and jack pine. Some industrial adjustments will help.

At Brainerd there is an opportunity, in so far as raw materials are concerned, for new industries founded on pine and aspen rather than spruce and fir. A kraft mill or mill manufacturing fiberboard could make more effective use of the materials at hand than a groundwood paper mill.

In the Grand Rapids territory, there will be a better balance between the industries and the forest if greater use can be made of balsam fir and aspen. In the long run there should be opportunities to develop new industries at Grand Rapids, Deer River and other nearby points to handle hardwoods, aspen and even pine.

In the Bemidji territory some curtailment in production of white and Norway pine is desirable.

Needed Adjustments in Management

One of the largest items of depletion in the Central Pine Area is loss from fire. During the past two years, as a result of emergency conservation work, losses have been greatly reduced. It is desirable to consolidate these gains and make provision for permanent reduction of this serious drain. If fire losses can be reduced two-thirds, the growth and depletion of sawlog material will be brought into approximate equilibrium.

Improved fire protection is most urgently needed in the southern part of the district, which is most inflammable, most exposed to fire risks and has been most thinly manned. The sandy pine lands in this part of the district will respond readily to improved protection by reproducing rapidly.

Promiscuous cutting of the small thrifty trees - spruce, Norway and jack pine - has done much to retard the natural development of forests in this region. Much potential growth is sacrificed when thrifty pine stands less than ten inches in diameter or thrifty black spruce stands less than six inches are cut. Thinning out inferior trees and the logging of small material on stagnant swamps is not objectionable but general clear cutting of young growing stands should be discouraged.

There is probably no reason why the mature old growth white pine which occurs in scattered stands and in private ownership should not be logged and milled as needed. Gradual rather than rapid removal would be preferable. For the old growth pine in public ownership, however, sentimental as well as business reasons suggest retention of remaining stands. At least 20,000 and preferably 30,000 acres of virgin timber should be retained for aesthetic and recreational purposes. Over-mature and defective pine may be removed as occasion demands and in some cases the understory of balsam fir and aspen may be cut, but otherwise the stands should be kept intact. The most attractive virgin areas are on the Red Lake Indian Reservation, in Bemidji Park, Buena Vista State Forest, George Washington State Forest, Itasca Park and on the Chippewa National Forest.

Removal of mature balsam fir should be encouraged since this species becomes very defective after it reaches a diameter of 10 to 12 inches.

To prevent complete exhaustion of merchantable spruce pulpwood, more conservative cutting is desirable.

Needed Adjustments in Public Ownership

Some of the sore spots in the present ownership situation are these:

(1) Except in the original Chippewa National Forest and some of the State Parks, public agencies have so far been able to purchase or otherwise acquire only the poorer forest lands. Tracts which hold the key to timber production in the early future are still in private ownership and are still subject to destructive use.

(2) Ownership within public forests is badly mixed and unsatisfactory from the standpoint of economical management. The State owns large acreages within National Forests boundaries. On the other hand, in some of the newly established State Forests the State owns only two to five percent of the land. The federal government likewise owns only about a third of the land within the Chippewa National Forest.

(3) No private wood using agency owns a sufficient block of contiguous forest land to develop a sustained yield unit.

(4) The great bulk of deforested land outside of the farming and resort districts is not considered by individuals or companies as a promising field for private endeavor. Large areas are not at present paying taxes. Logically, such lands which have been abandoned by the owners and which form a definite public burden (protection and administration) should be incorporated into the public forests. Existing tax delinquency legislation will accomplish this in a few but not all of the forest units.

Certain conclusions seem justifiable on the basis of these peculiar conditions:

(1) Federal purchases within the Chippewa National Forest should preferably include a large proportion of already stocked pine, spruce and balsam land - land which on account of location and condition can contribute at a reasonably early date to maintenance of forest industries, but which under private management seems headed for destructive use.

(2) Similar purchases are desirable within State Forests. If federal aid for purchasing land in State Forests becomes available under the Fulmer Act, it should be concentrated on such key tracts.

(3) State and federal ownership should be consolidated by means of a general land exchange. This will require an amendment to the State Constitution as well as new legislation. Such enactments would permit the State to exchange 100,000 acres of scattered land within the Chippewa National Forest for solid blocks of land elsewhere.

(4) Lands which have reverted to State ownership as a result of long-time tax delinquency, if they lie within public forest boundaries (including National Forests), should be turned over to the State Conservation Department for management, or for exchange with the federal government.

Possibilities for Private Forestry

The best possibilities for private forestry seem to exist in the farm sections adjacent to Grand Rapids, Brainerd and Bemidji. In these localities, production of pulpwood, mine timbers, box bolts and cedar products can be integrated with farming and resort development and thus permit a practical form of farm management in a region where crop production alone would fail. Farm forestry is also possible throughout the southern and western part of the district where woodland joins the prairies and densely settled farm communities. There is an assured market for fuelwood, fence posts and other minor products.

The future extent of commercial forestry is problematical. It seems likely that most sawmills will continue to depend upon custom sawing or logs purchased from the public forests and from farmers. Several different Minnesota pulp mills drawing supplies from the district may find it advantageous to prepare a definite forest management plan and acquire additional timber lands to assure a sustained yield for spruce and balsam fir.

Several means of stimulating private forest management are practicable under existing or pending State and National legislation. Among these may be mentioned: (1) providing long term credit for industrial forest development; (2) changing timberland taxes; (3) providing technical assistance in preparation of management plans; (4) doing additional extension work among farmers to develop cooperative management and marketing facilities; (5) offering cheap nursery stock for forest planting; (6) giving complete fire protection.

A further possibility exists in the management of public forest lands in a way which will supplement and further the plans of industries operating on a permanent basis.

SUMMARY OF CONCLUSIONS

The extent to which new forests, new industries and new employment will develop in the Central Pine District will depend to a great extent upon the activities of public agencies.

The 400,000 acres of sawtimber and million acres of restocking pine, spruce, balsam and tamarack land are a promising nucleus for the creation of a permanent self-sustaining group of industries. Safeguarding this existing growing stock in whatever ownership it may be, should be the first aim of public policy.

The two and a half million acres of aspen and scrub oak are already yielding some valuable products. Under good protection and proper forest management, many of these stands can be gradually converted to more productive pine, balsam and spruce types.

Restoration of the 900,000 acres of completely devastated lands, while of little significance from the standpoint of immediate timber production, is a desirable long-time goal.

These several aims can be best accomplished by a public policy which will embrace the following steps;

1. Set up a permanent and dependable fire protective organization for the district as a whole. This should at least be comparable in effectiveness to that provided now on a temporary basis with federal emergency funds.
2. Encourage better management of the large area of productive forest land still in farms and other private ownership. Extension work among farmers to demonstrate better methods of cutting, offer of planting stock at cost, assistance in developing cooperative marketing organizations, are possibilities for immediate application. Possibility of changes in taxation and provision of long time credit for forest management enterprises should be seriously considered.
3. Acquire key tracts of valuable second growth which seem committed to permanent mismanagement or destruction under private ownership. Deforested and other poor lands which have little possibility of development by private owners should also logically be acquired by the public.
4. Consolidate ownership and place all public forests under a definite plan of management. To bring State forests to a desirable level there have been proposed (1) federal financial loans for acquisition (Fulmer Act), (2) a general exchange act to permit trades with the federal government, (3) changes in laws creating State Forests to permit accepting tax reverting land within National Forests as State Forest property, (4) a permanent administrative organization.

From the standpoint of the general public good, the public forest agencies must strive for the best possible forest management in the district as a whole, and to give priority to those measures which will most effectively accomplish this end.

DEFINITION OF TERMS USED IN TABLES

FOREST COVER TYPES

Stands are classified into forest cover types according to the dominance of a key species, or group of species. Thus, the jack pine type includes stands consisting of 50 percent or more of this species. In the spruce-balsam type both white spruce and balsam fir are considered key species.

CONDITION CLASSES

SAWTIMBER STANDS are those having 2,000 board feet per acre or more of timber suitable for sawlogs. If more than half of the volume occurs in trees over 15 inches in diameter at breast height, the stand is classified as OLD GROWTH SAWTIMBER; if more than half of the sawlog volume occurs in smaller trees the stand is classified as SECOND GROWTH SAWTIMBER.

CORDWOOD STANDS are those having 3 cords or more per acre of trees 5.0 inches or larger, exclusive of sawtimber trees, but with less than 2,000 board feet per acre.

RESTOCKING AREAS have at least 10 percent of the ground occupied by trees less than 5.0 inches in diameter.

DEFORESTED AREAS do not qualify for any one of the above three classes, but are forest lands.

OWNERSHIP CLASSES:

Federal - National Forest and Vacant Public Domain.

Indian - Lands held in trust for Indians. Does not include patented allotments.

State - Unsold and reverted grant lands; lands under contract of sale which are delinquent in interest payments for two or more years; Rural Credits ownership; reforestation and flood control lands.

County - County owned land other than highways.

Large Private - Owners of at least 1,800 acres. Ownership assumed to rest with whoever paid the taxes for 1932.

Small Private - Owners of less than 1,800 acres.

MERCHANTABLE PRODUCTS

Living trees only are included in all volume estimates.

Sawtimber is scaled by the Scribner Decimal C Log Rule. The volume includes trees 9.0 inches or more in diameter at breast height which would yield a 10-foot log of high quality or a 16-foot log of inferior quality, having a diameter at the small end of not less than 8 inches in hardwoods or 6 inches in softwoods.

Pulpwood includes wood of suitable species and quality, exclusive of sawtimber, which occurs in trees producing at least two 8-foot sticks; spruce, pine, balsam fir, tamarack and aspen are considered pulpwood species. Pulpwood in tops of sawtimber trees and in small trees is included again in the cordwood estimate.

Cedar poles are at least 16 feet long, the majority 16 to 25 feet long.

Cedar posts are 7 feet long. Split posts are not commonly utilized in this district. The material is suitable for lagging.

Cordwood is measured in terms of standard cords, 4' x 4' x 8'. Small trees include those 5.0 inches or larger in diameter at breast height which are unsuitable for sawtimber. The volume of the stump and all wood less than 4.0 inches in diameter is excluded.

Tops and limbs include non-sawlog material to a 4-inch top in merchantable sawtimber trees. Limbs are excluded in softwood species.

Cordwood in small trees and tops includes pulpwood.

Cull includes the entire volume to a 4-inch top of trees unsuitable for either sawtimber or pulpwood and which can never attain merchantability because of form or defect.

Cubic volume of sawtimber and cedar products was derived by direct computation. The cubic volume of the cordwood material is expressed by the following ratios of cubic feet per cord:

Small trees, 72; Tops and Limbs, 60; Cull, 67.

CLASSES OF LAND

Improved Farm - Crop, fallow land and cleared pasture.

Rights-of-Way - Highways and railroads. Transmission lines are included where they do not parallel roads.

Miscellaneous Industrial - Legal sub-divisions embracing open-pit iron mines, gravel pits, resort sites, small unplatted settlements.

Unused Open Land - Naturally non-forest brush and grass areas, including alder brush and open natural meadows.

Unsurveyed Waters - Includes beaches and rock outcrop, but excludes small streams less than 2 rods wide.

METHOD AND ACCURACY OF SURVEY

The statistics on timber volumes, growth, ownership and forest areas presented in this report were derived by a method of sampling designed to yield reliable information for an area of four million acres or more. The sample was obtained by running parallel lines ten miles apart east and west across the entire district and taking sample plots of one-fifth acre at 40-rod intervals along each line. In this way 9,033 sample plots were taken in the Central Pine District.

A complete count of living trees was made by diameter classes and species on each plot and the timber stand was classified as to type of cover and use. Ownership as determined from county and other public records was later added to the classification. Additional measurements on tree volumes, growth rates, kind and grade of merchantable products, etc., were taken on sample trees from each plot. These data were combined and averaged to show the quantity and character of timber on the average acre of each of the various classes of stands. The proportion of sample plots in each of the various classes of stands was used as an index of the extent of such type in the district.

Analysis and tests have demonstrated that this system of surveys gives remarkably accurate results when applied to extensive areas. For the district as a whole it is believed the estimate of volume may be considered reliable within limits of 3 or 4 percent. The actual error of sampling has been computed to be but 2 percent.

The reliability of the sawtimber volume estimate for individual types ranges from 3 percent in the case of aspen and 8 percent in jack pine, up to 30 per cent in the case of black spruce. Very uncommon species and types of course are subject to wider errors.

The figures on industries, production, consumption and industrial drain were determined by a complete canvass of all operations in the district. Domestic utilization was determined by canvass of representative communities, supplemented by statistics from the U. S. Census.

TABLE 1

PRIMARY WOOD-USING INDUSTRIES

NUMBER OF MILLS, EMPLOYMENT AND PRODUCTION

CENTRAL PINE DISTRICT

Minnesota

Type of Mill	No. of Mills	No. of Men Employed 1933	Output 1933	Percent of 1929 - 1933 Average
SAWMILLS (By Size)				
5 MM BF	3	120	10,482 MBF*	43.8
1-5 MM	13	184	9,601 "	53.5
100M-1000M	107	502	21,016 "	65.7
Under 100M	201	643	5,892 "	90.2
All Sawmills	324	1,449	46,991 "	58.5
Cooperage Mills	2	73	1,420 MBF	42.4
Excelsior Mills				
Lath Mills	12	68	2,308 M Pieces**	20.4
Pulp Mills	2	84	34,481 Cords***	100.0
Shingle Mills	21	69	1,027 M Pieces	40.2

* Lumber scale.

** Includes 75M fence pickets.

*** Amount of wood used.

TABLE 2

AVERAGE ANNUAL AMOUNT OF TIMBER CUT WITHIN DISTRICT

SELECTED SAWLOG PRODUCTS BY SPECIES*

Species	Lumber and Sawed Ties MBM**	Veneer and Cooperage Stock MBM**	Piling MBF***	Mine Timbers MBF***	Cabin Poles MBF***
Jack Pine	18,860		35	867	1,420
White Pine	13,344		35	199	
Norway Pine	12,407		2,902	504	920
Balsam Fir	3,478				360
Spruce	2,459			33	610
Tamarack	1,024			133	
Cedar	722				
Total Softwood	52,294		2,972	1,736	4,010
Poplar	30,223	122			
Basswood	5,716	2,105			
Birch	4,570				
Oak	2,323				
Ash	592				
Elm	591	644			
Maple	367				
Total Hardwood	44,382	2,871			
All Species	96,676	2,871	2,972	1,736	4,010

* Other sawlog products cut include telephone poles, lath, shingles, and hewed ties.

** Lumber scale.

*** Log scale.

TABLE 3

AVERAGE ANNUAL AMOUNT OF TIMBER CUT WITHIN DISTRICT

SELECTED CORDWOOD PRODUCTS BY SPECIES*

Species	Domestic Pulpwood Cords	Exported Pulpwood Cords**	Matchwood Veneer and Excelsior Cords	Mine Poles and Lagging Cords	Fence Posts M Pieces
Spruce	30,943	39,759			
Balsam Fir	2,336	21,236			48
Jack Pine	1,202	6,310		1,576	103
Norway Pine				1,780	7
Tamarack				2,860	34
Cedar				588	224
Aspen		2,323	4,650		
Birch			1,343		
Basswood			573		
Misc. Hdwds.					17
ALL SPECIES	34,481	69,628	6,566	6,804	433

* A part of this material is cut from sawtimber trees.

** About 50 percent goes out of the State; 50 percent to other parts of Minnesota.

TABLE 4

GENERAL CLASSIFICATION OF LAND

Minnesota

Class of Land*	Acres	Percent
NON-FOREST AREA		
Urban and Platted	17,300	.2
Improved Farm	980,300	13.6
Rights-of-Way	99,700	1.4
Miscellaneous Industrial	113,400	1.6
Open Bog or Marsh	425,500	5.9
Other Unused Open Land	205,400	2.9
Unsurveyed Waters	79,500	1.1
Total Non-Forest	1,921,100	26.7
FOREST AREA	5,284,900	73.3
GROSS LAND AREA	7,206,000	100.0

* See Page I of Appendix for definition of "Class of Land".

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ECONOMIC NOTES NO.3 OCT. 1935

THE FOREST SITUATION IN THE
CENTRAL PINE DISTRICT
MINNESOTA

In Table 5, "Area of Forest Land by Forest Cover Types and Condition Classes", the following block should be inserted in place of the corresponding block in the original table.

Forest Survey
Lake States Forest Experiment Station

CONIFEROUS SWAMP				
Spruce	221,500		67,200	154,300
Tamarack	166,000	3,100	37,000	125,900
Cedar	76,400	4,600	27,000	44,800
Non-productive	76,400		1,500	74,900
Total Swamp	540,300	7,700	132,700	399,900

ERRATA

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CENTRAL PINE DISTRICT
MINNESOTA

In Table 5, "Area of Forest Land by Forest Cover Types and Condition Classes", the following block should be inserted in place of the corresponding block in the original table.

		Forest Survey Lake States Forest Experiment Station		
CONIFEROUS SWAMP				
Spruce	221,500		67,200	154,300
Tamarack	166,000	3,100	37,000	125,900
Cedar	76,400	4,600	27,000	44,800
Non-productive	76,400		1,500	74,900
Total Swamp	540,300	7,700	132,700	399,900

TABLE 5

AREA OF FOREST LAND

BY FOREST COVER TYPES AND CONDITION CLASSES

FOREST COVER TYPE*	CONDITION CLASS*				
	All Classes	Sawtimber		Cord-wood	Restocking
		Old Growth	Second Growth		
PINE					
White Pine	62,100	30,300	12,300	11,700	7,800
Norway Pine	90,100	13,900	20,100	37,800	18,300
Jack Pine	480,800	2,400	59,400	200,400	218,600
Total Pine	633,000	46,600	91,800	249,900	244,700
UPLAND HARDWOODS					
Maple - Basswood	302,300	6,100	64,900	56,400	174 900
Oak	37,400	2,300	3,100	11,600	20,400
Total Hardwoods	339,700	8,400	68,000	68,000	195,300
BOTTOMLAND HDWDS.	199,300	800	29,400	71,800	97,300
SPRUCE - BALSAM	243,900	6,900	44,000	116,600	76,400
CONIFEROUS SWAMP					
Spruce	221,500			67,200	154,300
Tamarack	166,000		3,100	37,000	125,900
Cedar	76,400		4,600	27,000	44,800
Non-productive	76,400		1,500	74,900	
Total Swamp	540,300		7,700	132,700	399,900
MISCELLANEOUS					
Aspen - Birch	2,314,300	3,900	132,100	491,200	1,687,100
Scrub Oak	123,600			2,300	121,300
Deforested	890,800				
Total Misc.	3,328,700	3,900	132,100	493,500	1,808,400
ALL COVER TYPES	5,284,900	66,600	373,000	1,132,500	2,822,000

* See Page I of Appendix for definition of forest cover types and condition classes.

TABLE 6

OWNERSHIP OF FOREST LAND

BY FOREST COVER TYPES AND CONDITION CLASSES

FOREST COVER TYPE AND CONDITION CLASS	OWNERSHIP CLASS				
	All Owners	Federal and Indian	State	Large Private	Small Private
	Percent of Total Area of Type-Condition Class				
PINE					
Old Growth	100.0	40.0	6.6	37.6	15.8
Sec.Growth	100.0	13.9	10.1	26.0	50.0
Cordwood	100.0	6.6	4.0	20.4	69.0
Restocking	100.0	8.5	5.7	19.5	66.3
HARDWOODS					
Old Growth	100.0	58.5	16.6	12.4	12.5
Sec.Growth	100.0	14.7	4.0	9.1	72.2
Cordwood	100.0	12.4	10.5	14.9	62.2
Restocking	100.0	7.3	10.5	23.4	58.8
SPRUCE-BALSAM					
Sawtimber	100.0	6.8	8.3	41.7	43.2
Cordwood	100.0	8.0	17.3	27.3	47.4
Restocking	100.0	7.6	18.7	24.2	49.5
CONIFEROUS SWPS.					
Sawtimber	100.0	20.0	15.0	25.0	40.0
Cordwood	100.0	11.4	34.7	16.4	37.5
Restocking	100.0	7.2	39.9	12.9	40.0
MISC. TYPES					
Aspen-Birch	100.0	10.0	8.2	21.6	60.2
Scrub Oak	100.0	1.2	5.0	18.8	75.0
Deforested	100.0	6.9	13.6	16.9	62.6
ALL TYPES	100.0	9.2	12.3	20.0	58.5

TABLE 7

AREA OF STATE FORESTS - 1935

NAME OF FOREST	GROSS LAND AREA	STATE LAND
	(Acres)	(Acres)
SOUTHERN GROUP		
Pillsbury	43,040	1,845
Crow Wing	131,573	2,071
Bay Lake	65,695	681
Mille Lacs**	111,956	3,664
Smokey Hills	96,005	4,557
Foothills	176,580	7,450
Land O'Lakes	137,307	6,191
Total	762,156	26,459
NORTHWESTERN GROUP		
Itasca Park	33,000	32,000
White Earth	246,466	11,636
Mississippi Headwaters	89,239	5,373
Paul Bunyan	123,302	8,048
Blackduck	70,488	4,120
Buena Vista	69,849	4,275
Third River	46,080	17,279
Chippewa*	80,629	80,629
Total	759,053	163,360
NORTHEASTERN GROUP		
George Washington**	341,440	76,652
Savanna**	211,580	16,062
Total	553,020	92,714
TOTAL	2,074,229	282,533

* Within Chippewa National Forest.

** Lying partly outside of Central Pine District.

TABLE 8

AREA OF FORESTS UNDER FEDERAL CONTROL

NAME OF FOREST	GROSS LAND AREA	GOV'T. FOREST LAND
CHIPPEWA NATIONAL FOREST		
Original Forest	312,659	193,604
Purchase Area	637,800*	137,105
RED LAKE INDIAN FOREST	110,000	110,000
Total	1,060,459	440,709

* Now increased to 1,000 000 acres, with 360,000 acres government land.

TABLE 9

SUMMARY OF TIMBER VOLUME

PRODUCTS*	In Customary Units Of Measure		In Cubic Feet
	Unit	Volume	Thous. Cu. Ft.
Sawtimber	M Bd. Ft.	2,480,240	471,980
Pulpwood	Cords	3,965,000	---
Poles (Cedar)	Pieces	1,574,000	14,020
Posts (Round Cedar)	Pieces	1,292,000	3,520
Posts (Split Cedar)	Pieces	2,360,000	3,840
Cordwood			
Small Trees	Cords	11,934,000	859,290
Tops and Limbs	Cords	3,427,000	205,610
Cull	Cords	5,947,000	404,060
Total			1,962,320

* See definition of PRODUCTS on Pages I and II of Appendix.

TABLE 10

VOLUME OF SAWTIMBER BY SPECIES AND KIND OF STAND

Minnesota - Unit II

SPECIES	VOLUME IN THOUSAND BOARD FEET*			
	Total	In Old Growth Stands	In Second Growth Stands	On Cordwood Restocking or Deforested Land
White Pine	394,680	268,690	85,200	40,790
Norway Pine	379,560	158,540	132,670	88,350
Jack Pine	347,820	20,770	207,550	119,500
Spruce	168,450	46,660	88,580	33,210
Balsam	98,470	13,380	50,040	35,050
Tamarack	27,940		12,500	15,440
Total Softwood	1,416,920	508,040	576,540	332,340
Poplars	574,350	33,970	338,260	202,120
Elm	107,140	5,000	61,100	41,040
Paper Birch	106,230	12,610	57,550	36,070
Basswood	98,000	10,940	56,580	30,480
Oaks	63,720	6,510	32,340	24,870
Sugar Maple	47,270	12,470	23,500	11,300
Yellow Birch	5,260		2,710	2,550
Misc. Hardwoods**	61,350	670	35,180	25,500
Total Hardwood	1,063,320	82,170	607,220	373,930
All Species	2,480,240	590,210	1,183,760	706,270

* See Page I and II of Appendix for definition of kinds of stands

** Miscellaneous hardwoods include principally black ash, red maple, and ironwood.

TABLE 11

VOLUME OF PULPWOOD BY SPECIES AND CONDITION CLASSES

SPECIES	VOLUME IN STANDARD CORDS*				
	Total		In Sawtimber Stands	In Cordwood Stands	On Restocking or Deforested Areas
	Volume	Percent			
Aspen	1,565,000	39.5	227,000	1,120,000	218,000
Jack Pine	1,142,000	28.8	330,000	687,000	125,000
Balsam	572,000	14.4	304,000	233,000	35,000
Spruce	398,000	10.0	80,000	266,000	52,000
Other Conifers	288,000	7.3	90,000	164,000	34,000
Total	3,965,000	100.0	1,031,000	2,470,000	464,000

* See Pages I and II of Appendix for specifications for pulpwood.

TABLE 12

OWNERSHIP OF SAWTIMBER BY SPECIES GROUPS

SPECIES GROUP	OWNERSHIP CLASS*				
	All Owners	Federal And Indian	State And County	Large Private	Small Private
	MBF	MBF	MBF	MBF	MBF
White and Norway Pine	774,240	203,640	47,120	204,540	318,940
Jack Pine	347,820	20,980	23,030	75,000	228,810
Spruce and Other Conifers	294,860	30,360	45,870	76,640	141,990
Aspen	574,350	59,790	53,370	126,170	335,020
Hardwoods	488,970	54,590	48,710	101,600	284,070
All Species	2,480,240	369,360	218,100	583,950	1,308,830

OWNERSHIP OF PULPWOOD BY SPECIES

SPECIES	All Owners	Federal And Indian	State And County	Large Private	Small Private
	M Cords	M Cords	M Cords	M Cords	M Cords
Pines	1,334	113	78	282	861
Spruce	398	41	103	82	172
Balsam Fir	572	64	72	152	284
Tamarack	96	5	34	14	43
Aspen	1,565	167	133	338	927
All Species	3,965	390	420	868	2,287

* See Pages I and II for defintion of Ownership Classes.

TABLE 13

AVERAGE VOLUME OF TIMBER PER ACRE

BY FOREST COVER TYPES AND CONDITION CLASSES*

FOREST COVER TYPE	Sawtimber Stands		Cordwood Stands		Restocking Areas	
	Bd. Ft.	Cu. Ft.**	Bd. Ft.	Cu. Ft.	Bd. Ft.	Cu. Ft.
PINE	6,070	1,817	411	638	84	80
White Pine	8,631	2,321	430	551	336	142
Norway Pine	6,746	1,674	524	618	192	134
Jack Pine	3,934	1,547	389	647	66	73
UPLAND HARDWOODS	2,674	1,303	543	625	179	134
Maple - Basswood	2,745	1,339	552	625	199	143
Oak	1,733	826	489	622	20	54
BOTTOMLAND HDWDS.	3,120	1,414	544	610	251	195
SPRUCE - BALSAM	4,498	1,662	671	689	156	160
CONIFEROUS SWAMP	2,075	1,814	176	573	8	50
Spruce			137	487	5	47
Tamarack	3,726	1,641	169	395	4	30
Cedar	965	1,928	230	1,048	43	176
Non-Productive				285	1	17
MISCELLANEOUS			343	641	65	47
Aspen - Birch	2,870	1,449	344	642	65	46
Scrub Oak			295	326	94	54
TOTAL ALL TYPES	4,035	1,568	397	634	75	64

* See Pages I and II of Appendix for definition of forest cover types and condition classes.

** Cubic foot volume includes all merchantable products as well as tops and limbs of sawtimber trees to a 4 inch minimum diameter and unmerchantable trees 5.0 inches or larger at breast height.

TABLE 14

VOLUME OF TIMBER

BY FOREST COVER TYPE AND PRODUCTS*

FOREST COVER TYPE	Sawtimber		Pulpwood		Total Volume**	
	MBF	Percent	M Cords	Percent	M Cu.Ft.	Percent
PINE						
White Pine	375,290	15.13	120	3.03	106,450	6.61
Norway Pine	252,710	10.19	155	3.91	82,720	5.13
Jack Pine	335,330	13.52	1,105	27.87	241,240	14.97
Total Pine	963,330	38.84	1,380	34.80	430,410	26.71
UPLAND HARDWOODS						
Maple - Basswood	260,810	10.52	81	2.04	155,310	9.64
Oak	15,440	.62	8	.20	12,780	.79
Total Hardwoods	276,250	11.14	89	2.24	168,090	10.43
BOTTOMLAND HDWDS.	157,680	6.36	74	1.87	105,470	6.55
SPRUCE - BALSAM	318,790	12.85	459	11.58	177,180	11.00
CONIFEROUS SWAMP						
Spruce	10,650	.43	221	5.57	39,970	2.48
Tamarack	19,180	.77	79	1.99	23,500	1.46
Cedar	12,550	.51	39	.98	45,030	2.79
Non-productive	70	.00	5	.13	1,700	.11
Total Swamp	42,450	1.71	344	8.68	110,200	6.84
MISCELLANEOUS						
Aspen - Birch	665,030	26.81	1,558	39.29	590,090	36.62
Scrub Oak	11,920	.48	13	.33	7,310	.45
Deforested	44,790	1.81	48	1.21	22,440	1.40
Total Misc.	721,740	29.10	1,619	40.83	619,840	38.47
ALL COVER TYPES	2,480,240	100.00	3,965	100.00	1,611,190	100.00

* See Pages I and II of Appendix for definitions of products and forest cover types.

** Total Volume excludes cull trees.

TABLE 15

ANNUAL GROWTH* OF TIMBER
BY FOREST COVER TYPES AND KIND OF PRODUCT

FOREST COVER TYPE	SAWTIMBER** Per Acre Bd.Ft.	SAWTIMBER** Total M Bd.Ft.	PULPWOOD*** Per Acre Cords	PULPWOOD*** Total M Cords	TOTAL VOLUME**** Per Acre Cu.Ft.	TOTAL VOLUME**** Total M Cu.Ft.
PINE						
White Pine	37	2,280	.05	3	23	1,430
Norway Pine	79	7,130	.17	15	49	4,400
Jack Pine	58	28,040	.17	82	38	18,340
All Pine	59	37,450	.16	100	38	24,170
UPLAND HARDWOODS						
Maple - Basswood	32	9,580	.01	4	19	5,840
Oak	18	670	.02	-	20	760
All Hardwoods	30	10,250	.01	4	19	6,600
BOTTOMLAND HDWDS.	34	6,770	.02	4	24	4,870
SPRUCE - BALSAM	50	12,250	.08	19	29	7,130
CONIFEROUS SWAMP						
Spruce	5	1,140	.09	19	16	3,590
Tamarack	7	1,190	.03	5	11	1,760
Cedar	5	360	.02	2	25	1,890
Non-productive	1	40	.02	2	8	610
All Swamp	5	2,730	.05	28	15	7,850
MISCELLANEOUS						
Aspen - Birch	23	53,960	.08	175	25	57,590
Scrub Oak	5	590	.01	1	4	550
Deforested	3	2,250	-	3	2	1,920
All Misc.	17	56,800	.05	179	18	60,060
ALL COVER TYPES	24	126,250	.06	334	21	110,680

* Periodic annual growth for next 10 years. See Pages I and II of Appendix for definition of Forest Cover Types and Kinds of Products.

** Per acre figures have been rounded to nearest board foot, totals to nearest 10,000 board feet. These are net Scribner volumes (excluding cull).

*** Per acre figures are rounded to nearest hundredth cord, totals to nearest thousand cords.

**** Includes sawtimber, pulpwood, and any additional volume between stump and 4 inch top. Per acre figures rounded to nearest cubic foot, totals to nearest 10,000 cubic foot.

TABLE 16

ANNUAL RATE OF DEPLETION BY COVER TYPE AND KIND OF MATERIAL

COVER TYPES (GROUPED)	Total Annual Depletion	Cut For Lumber (1)	Cut For Pulpwood	Cut For Fuel, Posts, etc.	Fire And Other Losses (2)
		TOTAL VOLUME - M CUBIC FEET			
White and Norway Pine	6,863	4,862	453	388	1,160
Jack Pine	11,137	5,704	472	2,155	2,806
Hardwoods (3)	9,416	5,031	597	1,125	2,663
Spruce-Balsam	9,597	3,217	3,250	627	2,503
Coniferous Swamp	6,932	1,417	3,470	456	1,589
Miscellaneous (4)	28,125	9,938	874	4,330	12,983
All Types	72,070	30,169	9,116	9,081	23,704
		SAWTIMBER TREES - M BOARD FEET			
White and Norway Pine	25,292	21,944	938	199	2,211
Jack Pine	22,944	19,336	214	831	2,563
Hardwoods (3)	18,810	14,616	794	483	2,917
Spruce-Balsam	20,163	10,905	5,600	210	3,448
Coniferous Swamp	5,202	4,331	407	12	452
Miscellaneous (4)	45,287	32,899	886	1,136	10,366
All Types	137,698	104,031	8,839	2,871	21,957
		TREES BELOW SAWLOG SIZE - CORDS			
White and Norway Pine	17,418		3,019	5,135	9,264
Jack Pine	62,189		5,210	28,507	28,472
Hardwoods (3)	41,238		4,051	14,284	22,903
Spruce-Balsam	49,429		20,357	8,433	20,639
Coniferous Swamp	69,272		42,497	6,747	20,028
Miscellaneous (4)	204,197		7,758	59,537	136,902
All Types	443,743		82,892	122,643	238,208

(1) Including ties, veneer, cooperage, shingles, and other sawlog products.

(2) Assuming that fire losses will be held to 50 percent of the average losses during the ten year period 1924-33 inclusive. It is estimated that half of the sawtimber killed by fire, insects, wind, etc., in the white and Norway pine types will be salvaged.

(3) Maple - Basswood, Oak, and Bottomland Types combined.

(4) Aspen, scrub oak and deforested land.

TABLE 17

COMPARISON OF ANNUAL GROWTH WITH RATE OF DEPLETION BY

FOREST TYPE AND KIND OF PRODUCT*

FOREST COVER TYPE	SAWTIMBER MBF		PULPWOOD Cords**		TOTAL VOLUME M Cubic Feet	
	Growth	Drain	Growth	Drain	Growth	Drain
PINE						
White Pine	2,280	14,310	3,000	3,000	1,430	3,914
Norway Pine	7,130	10,982	15,000	2,000	4,400	2,949
Jack Pine	28,040	22,944	82,000	22,000	18,340	11,137
Total Pine	37,450	48,236	100,000	27,000	24,170	18,000
UPLAND HDWDS.						
Maple - Basswood	9,580	12,369	4,000	3,000	5,840	5,772
Oak	670	722	-	-	760	426
All Hardwoods	10,250	13,091	4,000	3,000	6,600	6,198
BOTTOMLAND HDWDS.	6,770	5,719	4,000	3,000	4,870	3,218
SPRUCE - BALSAM	12,250	20,163	19,000	28,000	7,130	9,597
CONIFEROUS SWAMP						
Spruce	1,140	803	19,000	42,000	3,590	3,875
Tamarack	1,190	2,167	5,000	4,000	1,760	1,421
Cedar	360	2,224	2,000	3,000	1,890	1,551
Non-productive	40	8	2,000		610	85
All Swamp	2,730	5,202	28,000	49,000	7,850	6,932
MISCELLANEOUS						
Aspen - Birch	53,960	41,859	175,000	41,000	57,590	26,469
Scrub Oak	590	708	1,000		550	367
Deforested	2,250	2,720	3,000	1,000	1,920	1,289
All Misc.	56,800	45,287	179,000	42,000	60,060	28,125
ALL COVER TYPES	126,250	137,698	334,000	152,000	110,680	72,070

* Growth is estimate for next 10 years. Drain is estimate based upon recent experience. (See Table 16 for details).

** Only material below sawlog size included.

PRINCIPAL FOREST TYPES IN THE CENTRAL PINE DISTRICT MINNESOTA 1934

UPPER RED LAKE

LOWER RED LAKE

R38W

T151N

R27W

R22W

R25W

T62N

BELTRAMI

BEMIDJI

WINNIBIGOSHISH LAKE

ITASCA

GRAND RAPIDS

HUBBARD

LEECH LAKE

CASS

CLEARWATER

PARK RAPIDS

CROW WING

BRAINERD

MORRISON

MILLE LACS LAKE

T138N

R40W

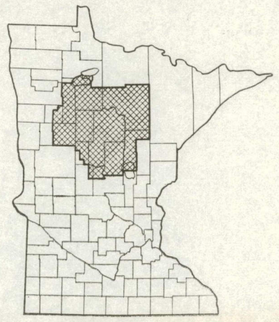
T131N

R32W

R29W

T44N

R25W



LEGEND –

- PINE
- ASPEN
- HARDWOODS
- SPRUCE, SPRUCE-BALSAM
- AGRICULTURAL LAND

NORTH

SCALE - MILES

5 0 5 10 15

PUBLICATION OF THE

LAKE STATES FOREST EXPERIMENT STATION

RAPHAEL ZON, DIRECTOR

***

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J. A. Diemer	Administrative Assistant
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